

FCC 15.249
2.4 GHz Report

for

FUTABA Corporation

**1080 YabutsukaChosei-son Chosei-gun
Chiba, 299-4395 Japan.**

Brand : Futaba
Product Name : Radio Control
Model Name : R324SBS
FCC ID : AZPR324SBS-24G

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



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TEST REPORT CERTIFICATION

Applicant : FUTABA Corporation
Manufacture : FUTABA Corporation
Product Name : Radio Control
Model No. : R324SBS
Serial No. : N/A
Brand : Futaba
Power Supply : DC 3.7-7.4V

Rules of Compliance and Measurement Standards:

FCC CFR 47 Part 15 Subpart C
ANSI C63.10:2013

AUDIX Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report. **AUDIX Technology Corp.** does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Test: 2017. 03. 13~20

Date of Report: 2017. 03. 27

Producer: Eva Chen
(Eva Chen/Assistant Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2017. 03. 27	Original Report.	EM-F170170

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	N/A, Note
15.205/ 15.209/ 15.249(a)	Radiated Band Edge and Radiated Spurious Emission Fundamental Frequency	PASS
----	Occupied Bandwidth 99% Power	Reference only
15.203	Antenna Requirement	PASS
Note: The EUT only employs battery power for operation, so it is unnecessary to test.		

3. GENERAL INFORMATION

3.1. Description of EUT

Product	Radio Control
Model Number	R324SBS
Serial Number	N/A
Brand Name	Futaba
Applicant	FUTABA Corporation 1080 YabutsukaChosei-son Chosei-gun Chiba, 299-4395 Japan.
Manufacture	FUTABA Corporation 1080 YabutsukaChosei-son Chosei-gun Chiba, 299-4395 Japan.
Transmit Type	1T1R
Date of Receipt of Sample	2016. 03. 01

3.2. EUT Specifications Assessed in Current Report

Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
2407.5-2467.5	31	T-FHSS	384

Modulation: T-FHSS			
Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2407.5	17	2439.5
2	2409.5	18	2441.5
3	2411.5	19	2443.5
4	2413.5	20	2445.5
5	2415.5	21	2447.5
6	2417.5	22	2449.5
7	2419.5	23	2451.5
8	2421.5	24	2453.5
9	2423.5	25	2455.5
10	2425.5	26	2457.5
11	2427.5	27	2459.5
12	2429.5	28	2461.5
13	2431.5	29	2463.5
14	2433.5	30	2465.5
15	2435.5	31	2467.5
16	2437.5		

3.3. Antenna Information

Antenna Part Number	Manufacture	Antenna Type	Frequency	Max Gain (dBi)
ANT1409	NISSEI	mono-pole type (coaxial)	2.4GHz	-5.16
ANT-S-1327	SANSEI ELECTRIC CO., LTD	PCB type	2.4GHz	-4.8

3.4. Test Configuration

Modulation	T _{on} (ms)	Duty Cycle Factor (dB)
T-FHSS	N/A	0

Item		Modulation	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	T-FHSS	1/31
	Radiated Spurious Emission (30MHz-1GHz) ^{Note1}	T-FHSS	1/15/31
	Radiated Spurious Emission (Above 1GHz) ^{Note1}	T-FHSS	1/15/31
	Fundamental Frequency	T-FHSS	1/15/31
	Occupied Bandwidth 99% Power	T-FHSS	1/15/31

Note 1:

☐ Mobile Device

☒ Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow:

☒ Lie

☐ Side

☐ Stand

Note 2: We performed testing of the highest and lowest data rate.

3.5. Tested Supporting System List

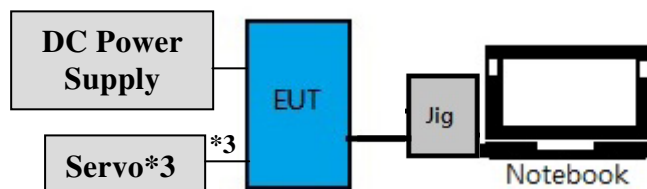
3.5.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook PC	DELL	P20G	P20G001	By DoC
2.	DC Power Supply	TOP WARD	3303A	N/A	N/A
3.	Servo*3	Futaba	S3004	N/A	N/A
4.	JIG	Futaba	CIU-2JIG	N/A	N/A

3.5.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	Adapter: ACBEL, M/N AA90PM111 Power Cord: I/P: Unshielded, Detachable, 1.8m O/P: Shielded, Undetachable, 1.8m, Bonded a ferrite core
2.	DC Power Cord*2: Unshielded, Detachable, 0.7m AC Power Cord: Unshielded, Undetachable, 1.8m
3.	Cable*3: Unshielded, Detachable, 0.15m
4.	Bun Cable: Unshielded, Detachable, 0.3m

3.6. Setup Configuration



3.7. Operating Condition of EUT

Test program “Futaba Term” is used for enabling EUT RF function under continues transmitting and choosing data rate/ channel.

3.8. Description of Test Facility

Test Firm Name	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	Semi-Anechoic Chamber & Fully Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724
FCC OET Designation	:	TW1004 & TW1090

3.9. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty = $k_{uc}(y)$

Test Item	Uncertainty
Occupied Bandwidth 99% Power	± 1kHz

4. MEASUREMENT EQUIPMENT LIST

4.1. Radiated Emission Measurement

4.1.1. Frequency Range 9kHz~1000MHz (Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2016. 09. 19	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2016. 06. 22	1 Year
3.	Amplifier	HP	8447D	2944A06305	2017. 02. 16	1 Year
4.	Bilog Antenna	TESEQ	CBL6112D	33821	2017. 01. 21	1 Year
5.	Test Software	Audix	e3	V.6.1206197	N.C.R.	N.C.R.

4.1.2. Frequency Range Above 1GHz (Fully Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2016. 09. 19	1 Year
2.	Amplifier	HP	8449B	3008A02678	2017. 03. 06	1 Year
3.	Horn Antenna	ETS-Lindgren	3117	00135902	2017. 03. 08	1 Year
4.	2.4GHz Notch Filter	K&L	7NSL10-244 1.5E130.5-00	1	2016. 07. 27	1 Year
5.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2016. 06. 07	1 Year

5. CONDUCTED EMISSION MEASUREMENT

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

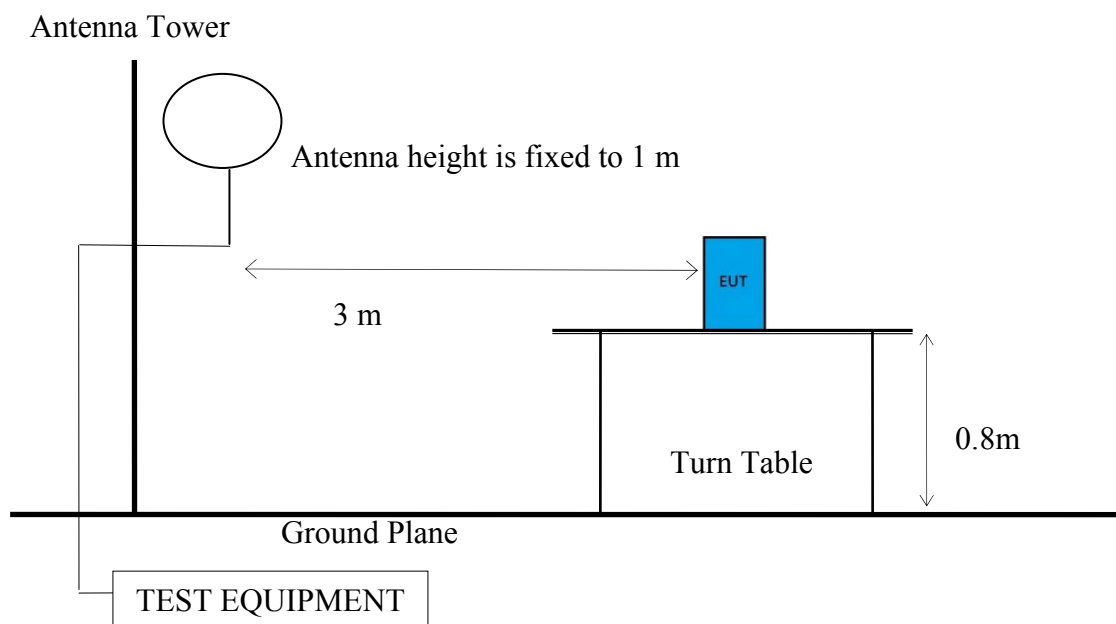
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

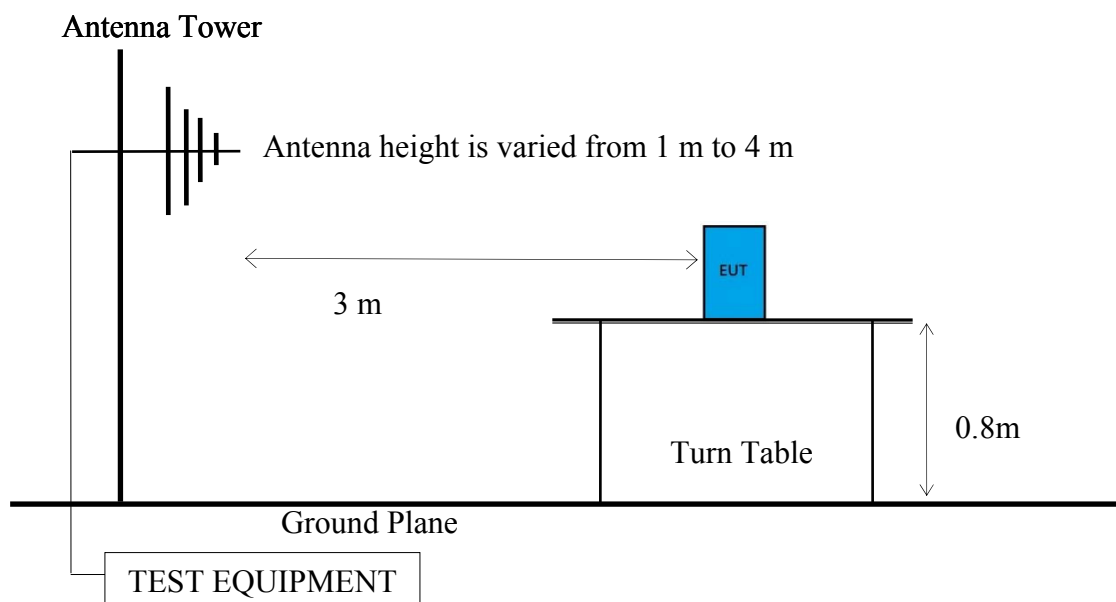
6.1.1. Block Diagram of EUT

Indicated as section 3.6

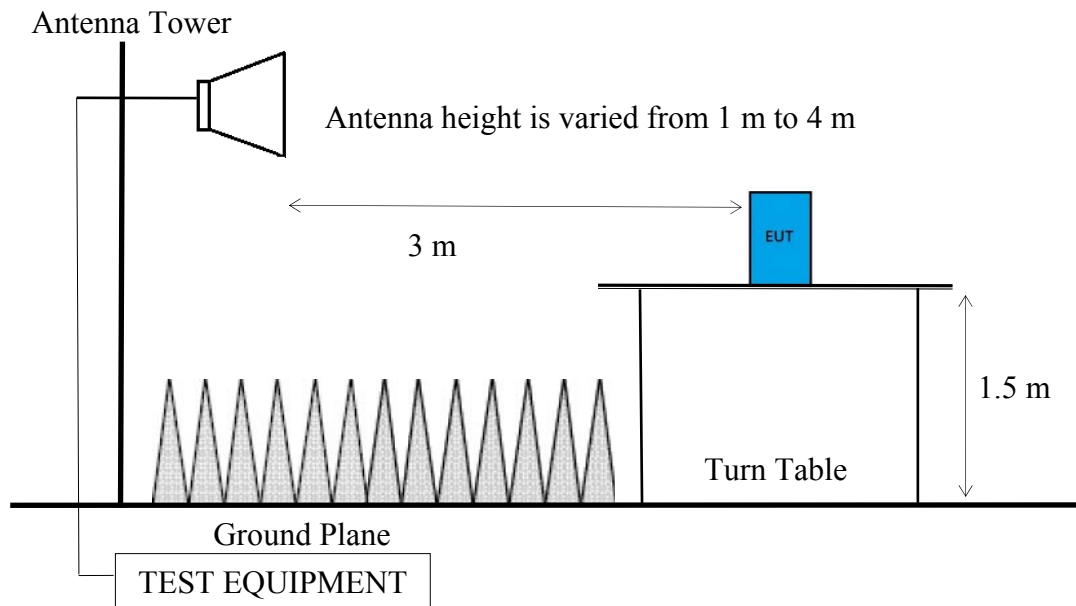
6.1.2. Semi Anechoic Chamber (3m) Setup Diagram for 9kHz-30MHz



6.1.3. Semi Anechoic Chamber (3m) Setup Diagram for 30-1000 MHz



6.1.4. Fully Anechoic Chamber (3m) Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

(2) The tighter limit applies to the edge between two frequency bands.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(4) Fundamental and emission fall within operation band are exempted from this section.

(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.2.2. Limite for Fundamental & Harmonics Frequency

Fundamental Frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dB μ V/m	μ V/m	dB μ V/m
902-928MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
2400-2483.5MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
5725-5875MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
24.0-24.25GHz	250	128 (Peak)	2500	88 (Peak)
		108 (Average)		68 (Average)

Remark: mV/m=1000 μ V/m; dB μ V/m = 20 log (μ V/m)

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turn find table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

Frequency above 1GHz to 10th harmonic:

Peak Detector:

- (1) RBW = 1MHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the average detector is not required. Otherwise using average for finally measurement.

Average Detector:**■ Option 1:**

(1) RBW = 1MHz

(2) VBW $\geq 1/T$.

N/A: $1/T$ is not implemented when duty cycle presented in section 3.4 is $\geq 98\%$.

(1) Detector = Peak.

(2) Sweep time = auto.

(3) Trace mode = max hold.

(4) Allow sweeps to continue until the trace stabilizes.

□ Option 2:

Average Emission Level = Peak Emission Level + D.C.C.F.

6.4. Measurement Result Explanation

■ Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading

■ Average Emission Level = Antenna Factor + Cable Loss + Meter Reading

□ Average Emission Level = Peak Emission Level + DCCF

Duty Cycle Correction Factor (DCCF) = $20\log(TX_{on}/TX_{on+off})$ presented in section 3.4

□ EPR = Peak Emission Level - 95.2dB - 2.14dB

6.5. Test Results

PASSED.

Test Date	2017/03/20	Temp./Hum.	26°C/43%
Test Voltage	DC 6.0V (via DC Power Supply)		

6.5.1. Emissions within Restricted Frequency Bands

6.5.1.1. Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

6.5.1.2. Frequency Below 1 GHz

Antenna A: ANT1409

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
224.97	17.44	3.59	39.69	35.00	46.00	11.00	Peak
394.72	22.61	5.50	35.21	36.94	46.00	9.06	Peak
497.54	23.73	6.41	34.46	37.48	46.00	8.52	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
224.97	17.44	3.59	38.43	33.74	46.00	12.26	Peak
497.54	23.73	6.41	35.51	38.53	46.00	7.47	Peak
623.64	24.97	6.83	31.20	35.61	46.00	10.39	Peak

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
224.97	17.44	3.59	41.29	36.60	46.00	9.40	Peak
345.25	21.23	4.92	33.99	34.12	46.00	11.88	Peak
498.51	23.73	6.41	34.70	37.72	46.00	8.28	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
225.94	17.49	3.60	37.76	33.13	46.00	12.87	Peak
449.04	23.27	6.01	36.94	39.43	46.00	6.57	Peak
497.54	23.73	6.41	36.13	39.15	46.00	6.85	Peak

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
225.94	17.49	3.60	40.70	36.07	46.00	9.93	Peak
385.02	22.35	5.39	34.29	35.70	46.00	10.30	Peak
498.51	23.73	6.41	36.11	39.13	46.00	6.87	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
225.94	17.49	3.60	39.05	34.42	46.00	11.58	Peak
450.98	23.29	6.02	39.47	41.99	46.00	4.01	Peak
622.67	24.97	6.83	30.95	35.36	46.00	10.64	Peak

Antenna B: ANT-S-1327

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
95.96	16.51	2.22	40.64	33.10	43.50	10.40	Peak
233.70	17.93	3.66	35.65	31.53	46.00	14.47	Peak
372.41	21.99	5.24	31.62	32.62	46.00	13.38	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
95.96	16.51	2.22	33.52	25.98	43.50	17.52	Peak
232.73	17.88	3.66	32.77	28.60	46.00	17.40	Peak
379.20	22.17	5.32	29.96	31.17	46.00	14.83	Peak

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
95.96	16.51	2.22	40.14	32.60	43.50	10.90	Peak
232.73	17.88	3.66	35.67	31.50	46.00	14.50	Peak
348.16	21.31	4.95	30.87	31.08	46.00	14.92	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	17.38	2.29	30.82	24.24	43.50	19.26	Peak
233.70	17.93	3.66	33.20	29.08	46.00	16.92	Peak
332.64	20.84	4.75	29.56	29.23	46.00	16.77	Peak

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
143.49	17.48	2.76	33.85	28.10	43.50	15.40	Peak
232.73	17.88	3.66	35.48	31.31	46.00	14.69	Peak
333.61	20.87	4.77	32.02	31.74	46.00	14.26	Peak

Antenna at Vertical Polarization

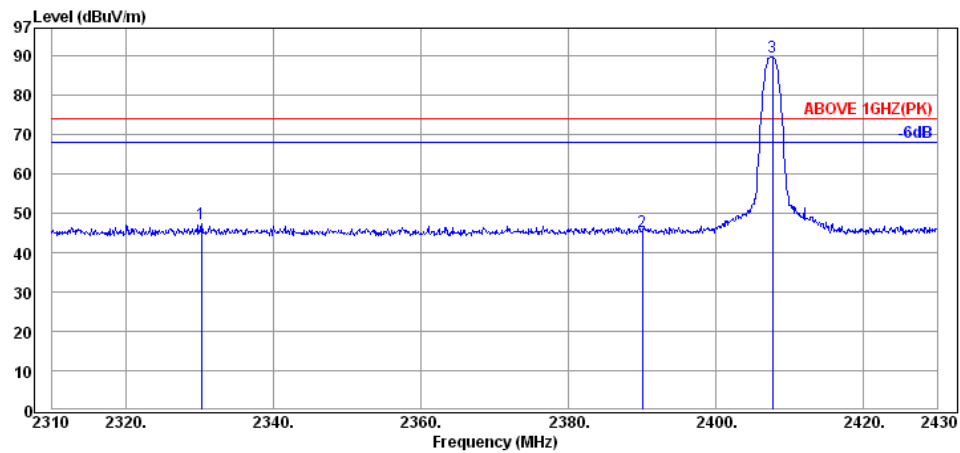
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
232.73	17.88	3.66	34.78	30.61	46.00	15.39	Peak
333.61	20.87	4.77	30.52	30.24	46.00	15.76	Peak
481.05	23.58	6.27	29.16	32.01	46.00	13.99	Peak

6.5.1.3. Frequency Above 1 GHz to 10th harmonics

Band Edge:

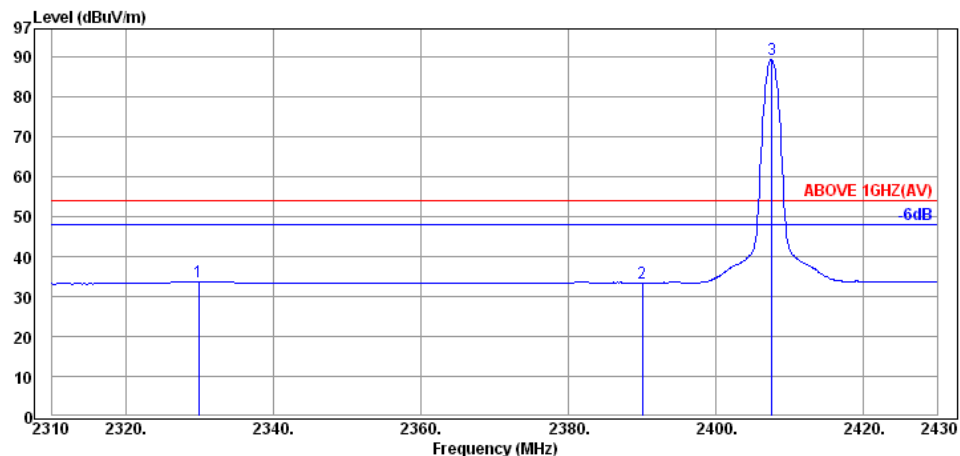
Antenna A: ANT1409

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

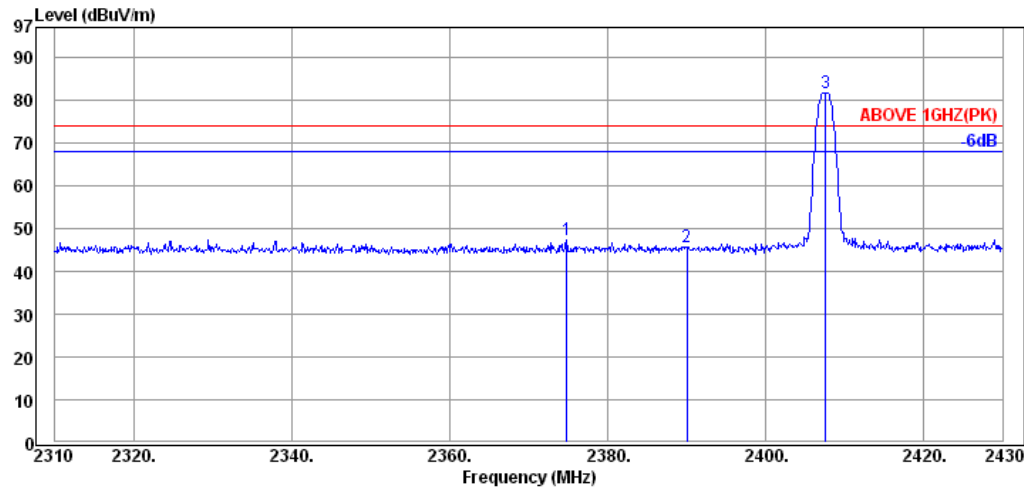
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2330.28	31.61	6.00	9.76	47.37	74.00	26.63	Peak
2390.04	31.68	6.08	7.59	45.35	74.00	28.65	Peak
2407.68	31.70	6.10	51.76	89.56	---	---	Peak



Antenna at Horizontal Polarization

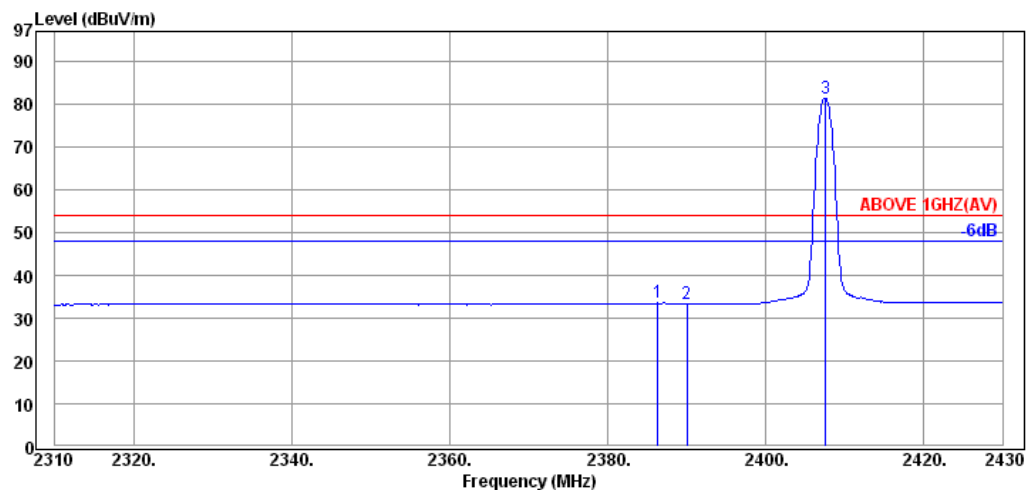
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2329.92	31.61	6.00	-3.91	33.70	54.00	20.30	Average
2390.04	31.68	6.08	-4.28	33.48	54.00	20.52	Average
2407.56	31.70	6.10	51.43	89.23	---	---	Average

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Vertical Polarization

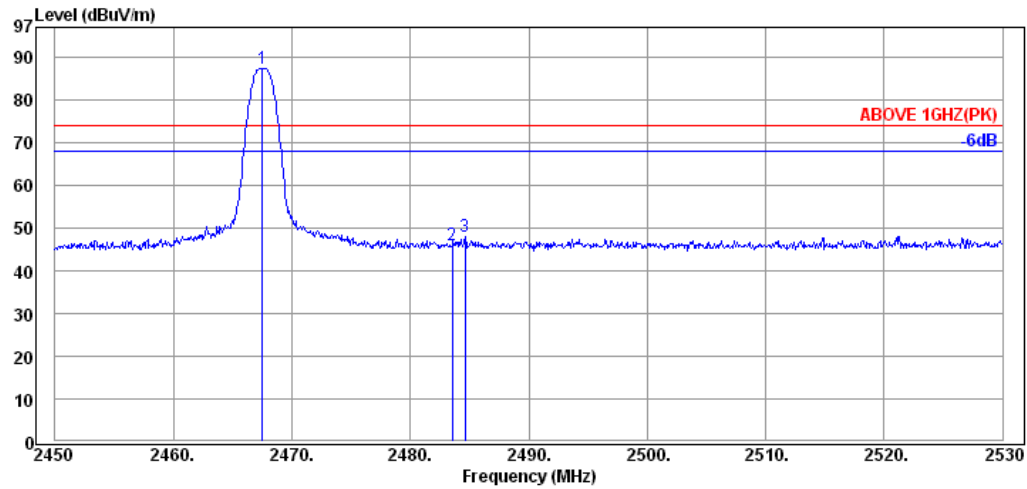
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2374.80	31.66	6.06	9.56	47.28	74.00	26.72	Peak
2390.04	31.68	6.08	7.87	45.63	74.00	28.37	Peak
2407.56	31.70	6.10	43.93	81.73	---	---	Peak



Antenna at Vertical Polarization

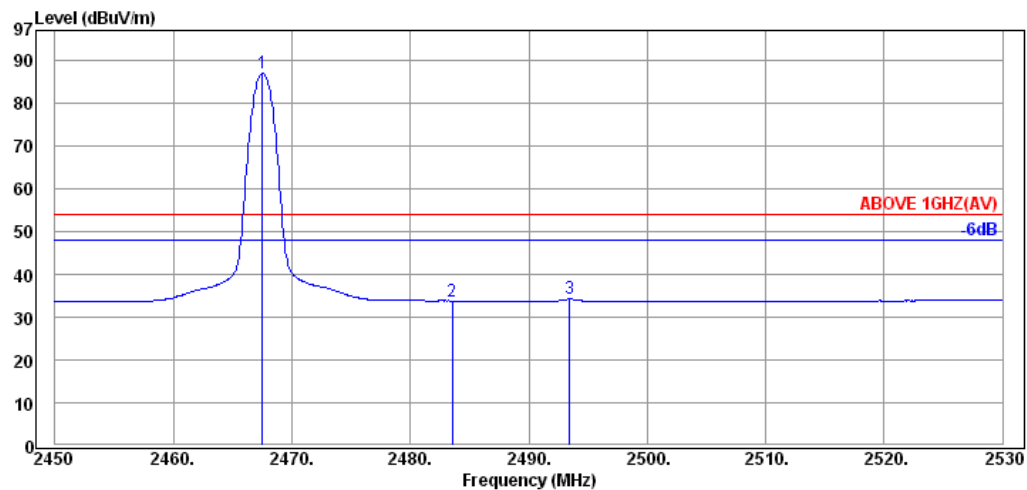
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2386.32	31.68	6.07	-4.23	33.52	54.00	20.48	Average
2390.04	31.68	6.08	-4.31	33.45	54.00	20.55	Average
2407.56	31.70	6.10	43.67	81.47	---	---	Average

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

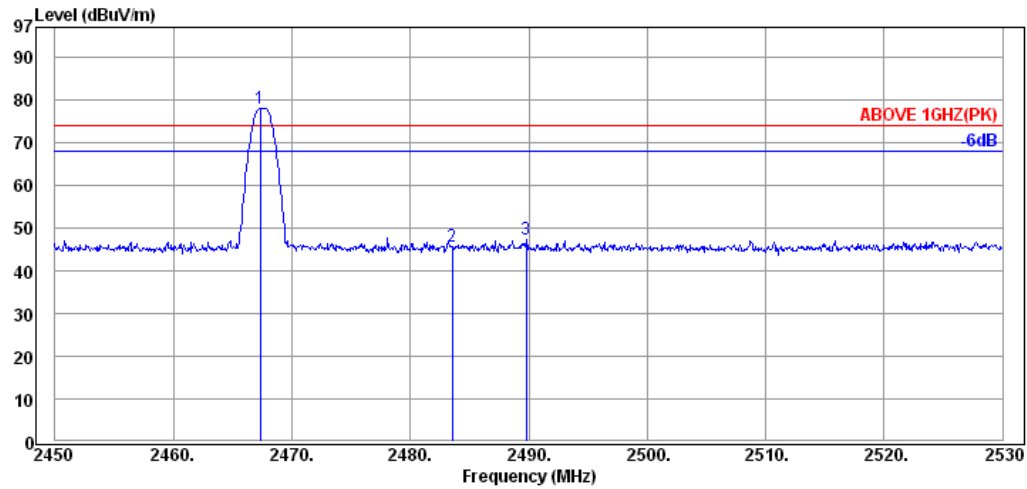
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	31.76	6.17	49.33	87.26	---	---	Peak
2483.52	31.78	6.19	7.93	45.90	74.00	28.10	Peak
2484.64	31.78	6.19	10.19	48.16	74.00	25.84	Peak



Antenna at Horizontal Polarization

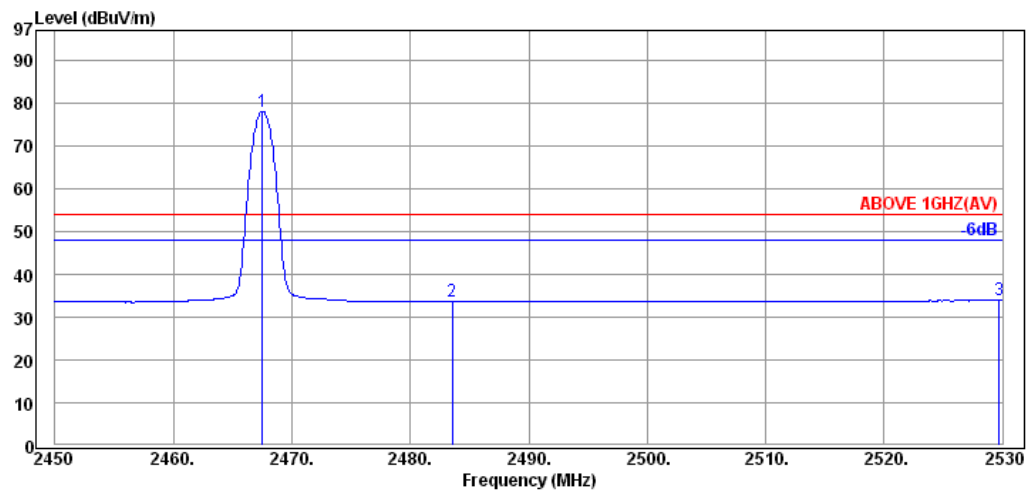
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	31.76	6.17	49.06	86.99	---	---	Average
2483.52	31.78	6.19	-4.16	33.81	54.00	20.19	Average
2493.44	31.79	6.20	-3.75	34.24	54.00	19.76	Average

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.36	31.76	6.17	40.12	78.05	---	---	Peak
2483.52	31.78	6.19	7.80	45.77	74.00	28.23	Peak
2489.76	31.79	6.19	9.49	47.47	74.00	26.53	Peak

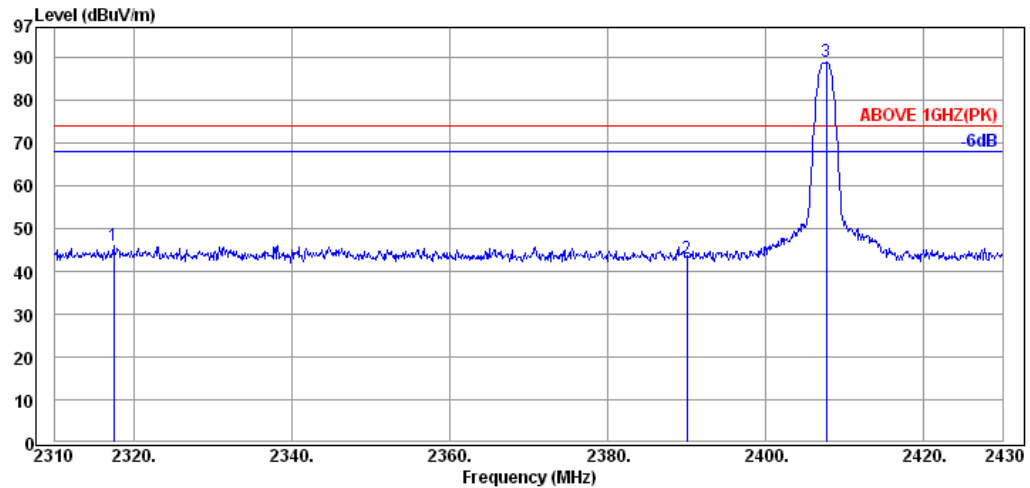


Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	31.76	6.17	40.09	78.02	---	---	Average
2483.52	31.78	6.19	-4.26	33.71	54.00	20.29	Average
2529.68	31.83	6.25	-4.15	33.93	54.00	20.07	Average

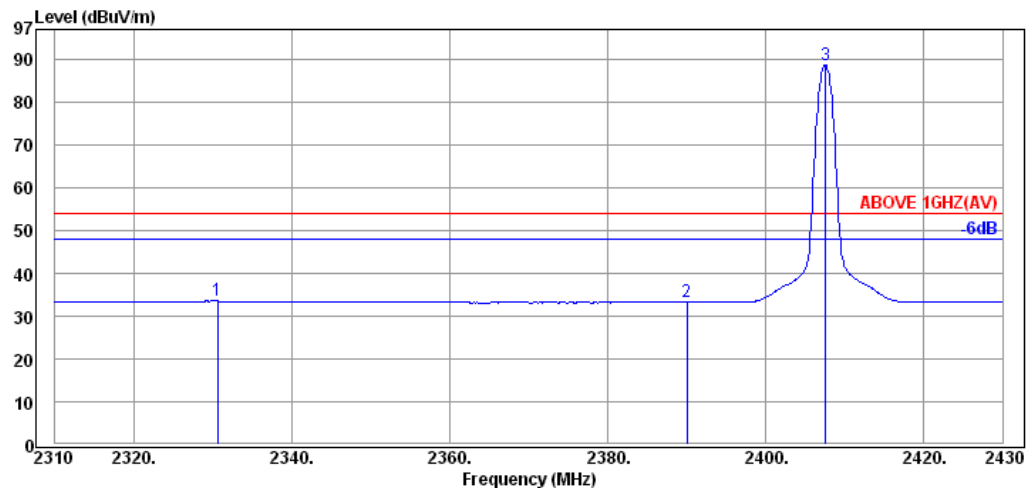
Antenna B: ANT-S-1327

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

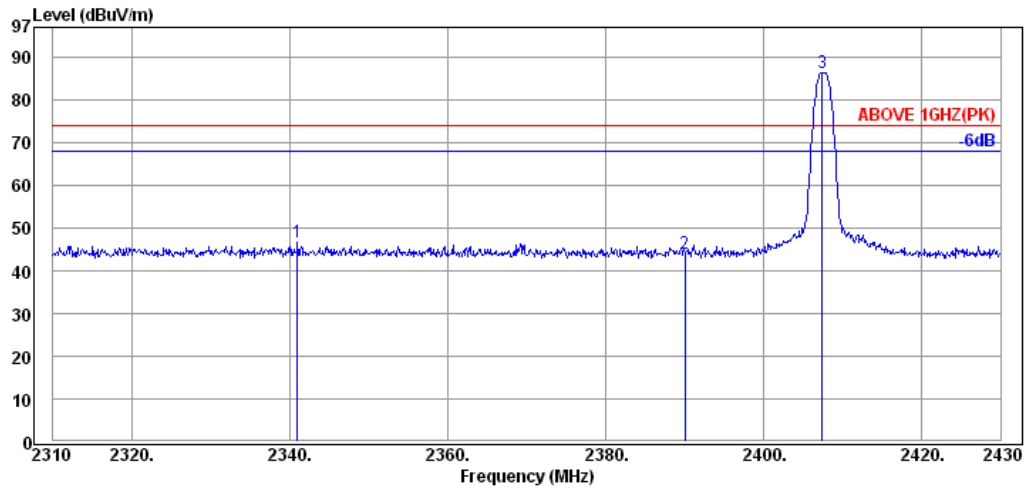
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2317.44	31.60	5.98	42.91	45.90	74.00	28.10	Peak
2390.04	31.68	6.08	39.70	42.85	74.00	31.15	Peak
2407.68	31.70	6.10	85.64	88.83	---	---	Peak



Antenna at Horizontal Polarization

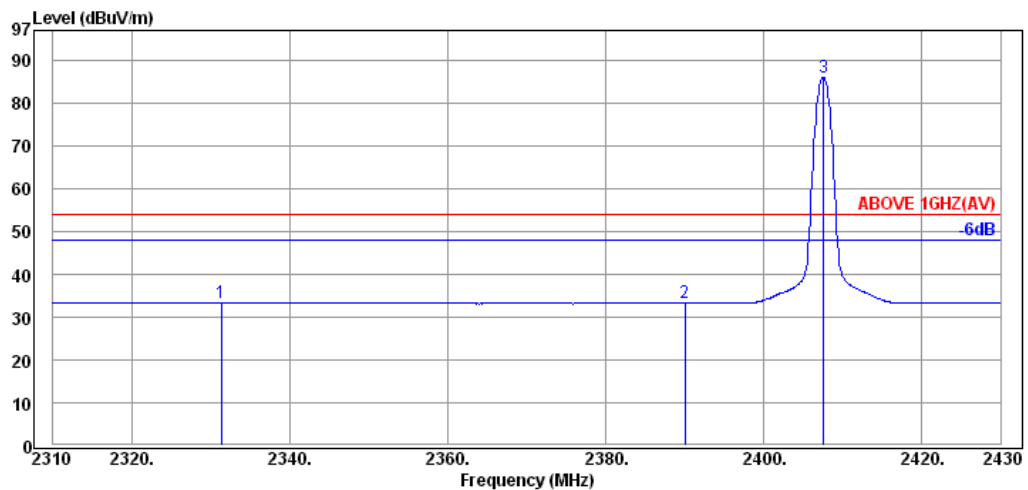
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2330.64	31.61	6.00	30.53	33.54	54.00	20.46	Average
2390.04	31.68	6.08	30.15	33.30	54.00	20.70	Average
2407.56	31.70	6.10	85.40	88.59	---	---	Average

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Vertical Polarization

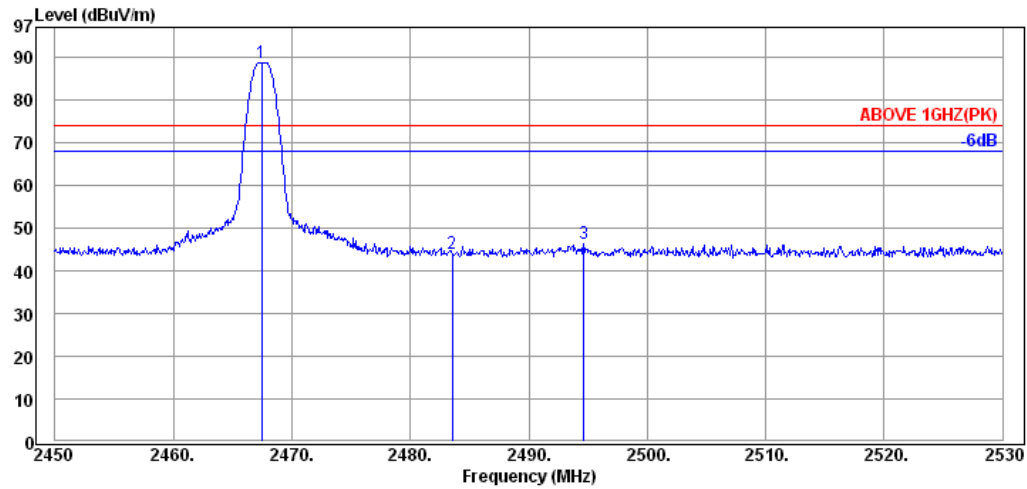
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2340.96	31.62	6.02	43.56	46.60	74.00	27.40	Peak
2390.04	31.68	6.08	40.78	43.93	74.00	30.07	Peak
2407.44	31.70	6.10	83.09	86.28	---	---	Peak



Antenna at Vertical Polarization

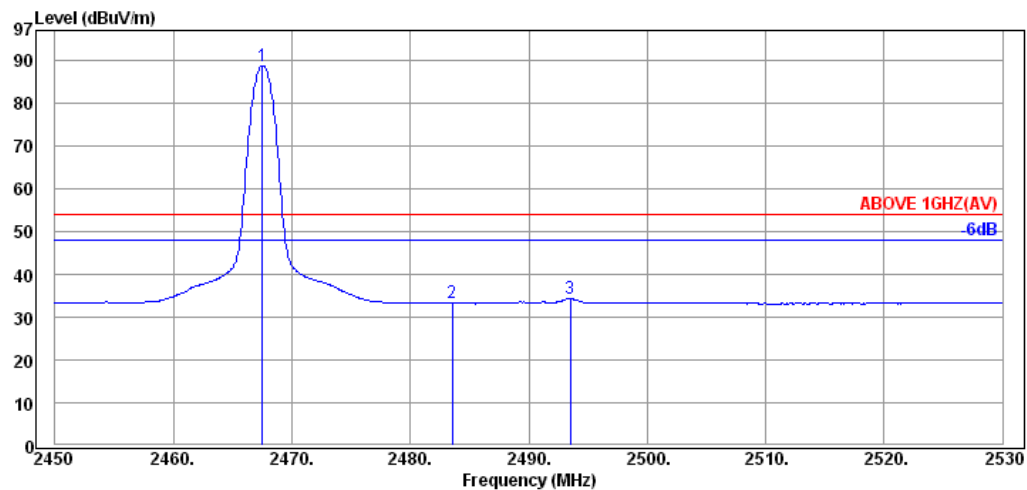
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2331.36	31.61	6.00	30.47	33.48	54.00	20.52	Average
2390.04	31.68	6.08	30.15	33.30	54.00	20.70	Average
2407.56	31.70	6.10	82.86	86.05	---	---	Average

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

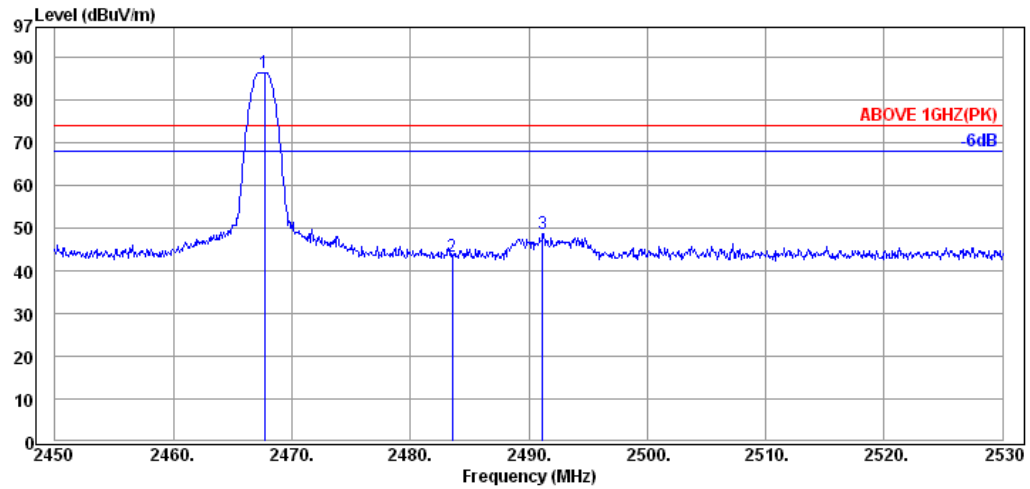
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.44	31.76	6.17	85.49	88.80	---	---	Peak
2483.52	31.78	6.19	40.71	44.05	74.00	29.95	Peak
2494.64	31.79	6.20	42.83	46.19	74.00	27.81	Peak



Antenna at Horizontal Polarization

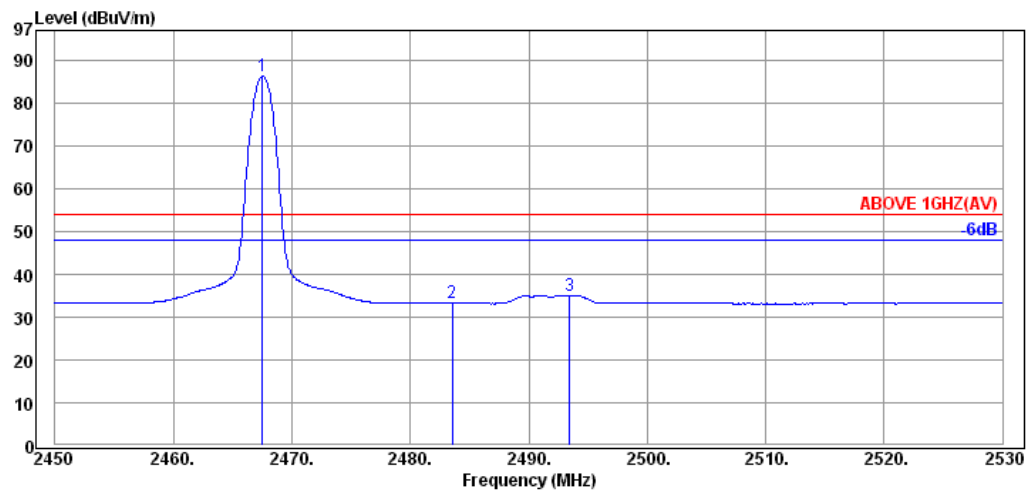
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	31.76	6.17	85.46	88.77	---	---	Average
2483.52	31.78	6.19	29.88	33.22	54.00	20.78	Average
2493.52	31.79	6.20	30.92	34.28	54.00	19.72	Average

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.68	31.77	6.17	83.15	86.47	---	---	Peak
2483.52	31.78	6.19	40.01	43.35	74.00	30.65	Peak
2491.20	31.79	6.20	45.22	48.58	74.00	25.42	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	31.76	6.17	82.90	86.21	---	---	Average
2483.52	31.78	6.19	29.83	33.17	54.00	20.83	Average
2493.44	31.79	6.20	31.76	35.12	54.00	18.88	Average

6.5.2. Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Antenna A: ANT1409

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4815.00	33.83	8.93	5.53	48.29	54.00	5.71	Peak
5655.00	34.70	10.08	2.15	46.93	54.00	7.07	Peak
7220.00	35.65	11.27	-1.31	45.61	54.00	8.39	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4815.00	33.83	8.93	5.94	48.70	54.00	5.30	Peak
5620.00	34.63	9.95	2.30	46.88	54.00	7.12	Peak
7220.00	35.65	11.27	0.31	47.23	54.00	6.77	Peak

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4870.00	33.85	9.09	5.91	48.85	54.00	5.15	Peak
6110.00	35.49	9.77	2.23	47.49	54.00	6.51	Peak
7220.00	35.65	11.27	0.09	47.01	54.00	6.99	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4870.00	33.85	9.09	3.15	46.09	54.00	7.91	Peak
6660.00	35.77	11.44	1.94	49.15	54.00	4.85	Peak
7220.00	35.65	11.27	-0.51	46.41	54.00	7.59	Peak

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4935.00	33.87	9.30	4.69	47.86	54.00	6.14	Peak
5840.00	35.10	10.26	2.56	47.92	54.00	6.08	Peak
7220.00	35.65	11.27	-0.58	46.34	54.00	7.66	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4935.00	33.87	9.30	4.62	47.79	54.00	6.21	Peak
5885.00	35.17	10.15	1.56	46.88	54.00	7.12	Peak
7222.50	35.65	11.27	1.90	48.82	54.00	5.18	Peak

Antenna B: ANT-S-1327

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3945.00	32.90	7.93	35.17	41.49	54.00	12.51	Peak
4815.00	33.83	8.93	40.40	48.64	54.00	5.36	Peak
5850.00	35.10	10.22	35.30	46.17	54.00	7.83	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
3775.00	32.62	7.74	36.77	42.58	54.00	11.42	Peak
4815.00	33.83	8.93	39.51	47.75	54.00	6.25	Peak
5665.00	34.73	10.08	34.77	45.22	54.00	8.78	Peak

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4560.00	33.73	8.67	37.81	45.66	54.00	8.34	Peak
4870.00	33.85	9.09	36.02	44.45	54.00	9.55	Peak
5875.00	35.17	10.18	34.59	45.47	54.00	8.53	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4870.00	33.85	9.09	37.49	45.92	54.00	8.08	Peak
5355.00	34.26	9.40	34.06	43.39	54.00	10.61	Peak
5920.00	35.23	10.07	33.87	44.68	54.00	9.32	Peak

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4935.00	33.87	9.30	38.87	47.53	54.00	6.47	Peak
5885.00	35.17	10.15	35.77	46.62	54.00	7.38	Peak
6490.00	35.79	11.27	35.97	48.43	54.00	5.57	Peak

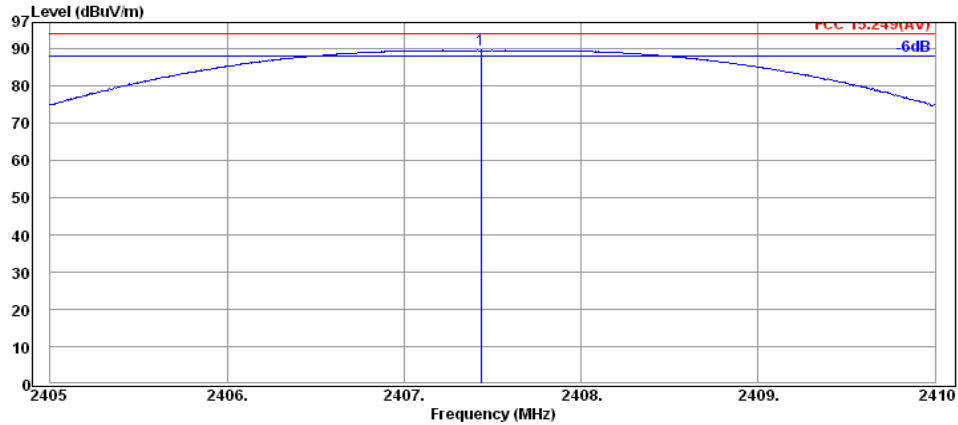
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4935.00	33.87	9.30	39.03	47.69	54.00	6.31	Peak
6190.00	35.56	9.66	36.88	47.54	54.00	6.46	Peak
7245.00	35.65	11.35	34.75	46.96	54.00	7.04	Peak

6.5.3. Fundamental Frequency:

Antenna A: ANT1409

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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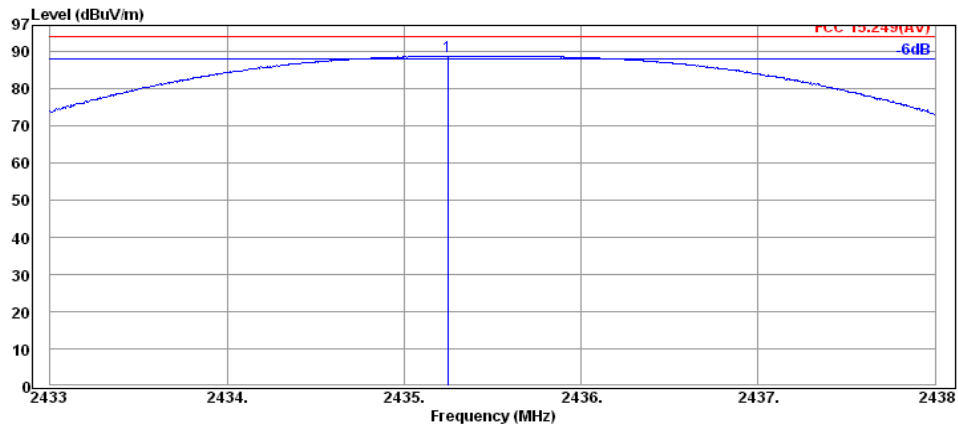


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2407.44	31.70	6.10	51.72	89.52	94.00	4.48	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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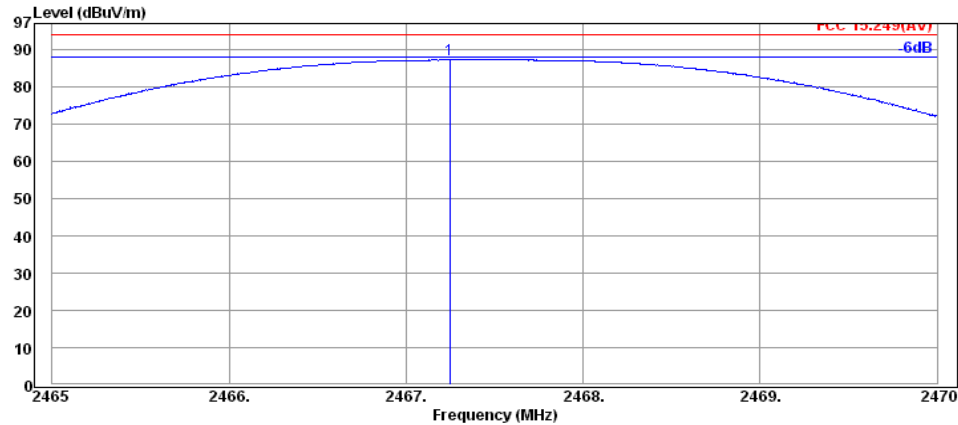


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2435.25	31.73	6.13	50.82	88.68	94.00	5.32	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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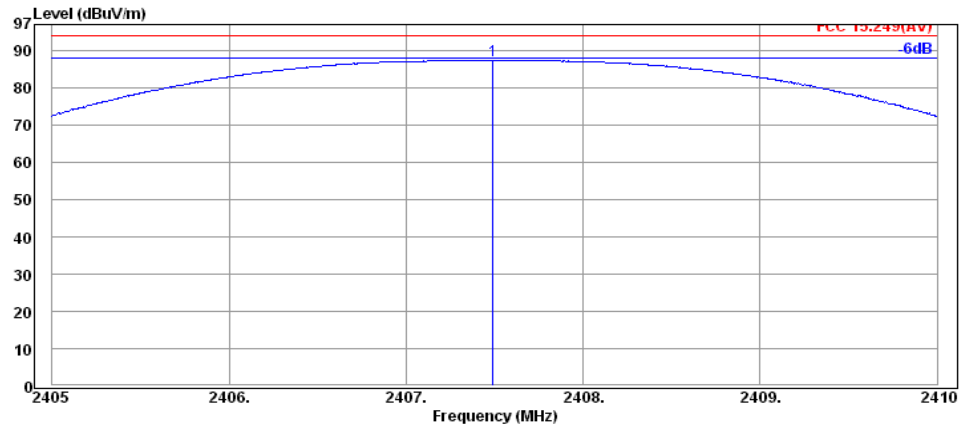
Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.25	31.76	6.17	49.30	87.23	94.00	6.77	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Antenna B: ANT-S-1327

Modulation	T-FHSS	Frequency	TX 2407.5MHz
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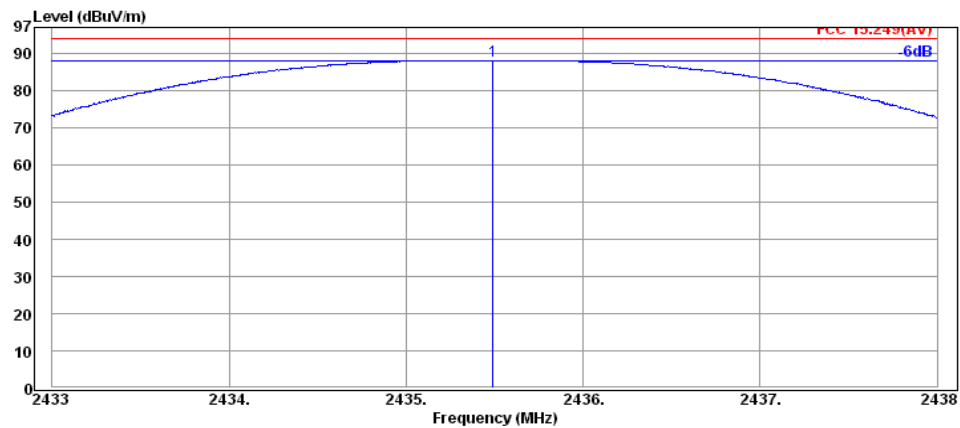


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2407.49	31.70	6.10	49.47	87.27	94.00	6.73	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Modulation	T-FHSS	Frequency	TX 2435.5MHz
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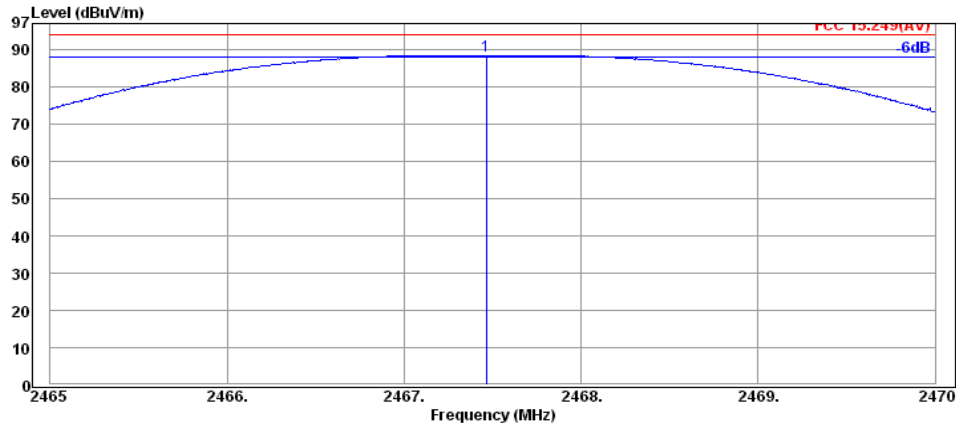


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2435.49	31.73	6.13	50.20	88.06	94.00	5.94	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Modulation	T-FHSS	Frequency	TX 2467.5MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.47	31.76	6.17	50.49	88.42	94.00	5.58	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

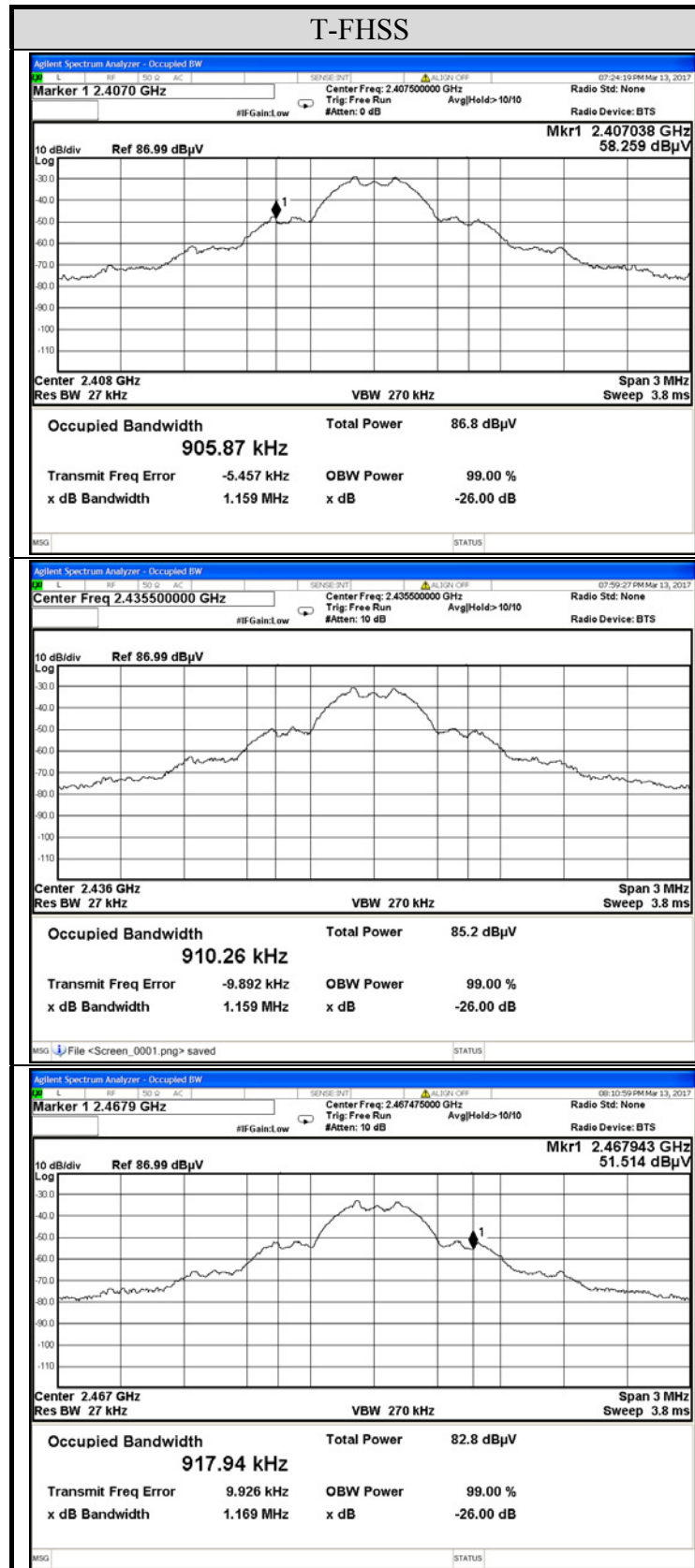
7. OCCUPIED BANDWIDTH 99% POWER MEASUREMENT

Test Date	2017/03/13	Temp./Hum.	26°C/43%
Cable Loss	---	Test Voltage	DC 6.0V (via DC Power Supply)

7.1.1. Occupied Bandwidth 99% Power Result

Modulation Type	Centre Frequency (MHz)	Occupied Bandwidth 99% Power (MHz)
T-FHSS	2407.5	0.90587
	2435.5	0.91026
	2467.5	0.91794

7.1.2. Measurement Plots



8. DEVIATION TO TEST SPECIFICATIONS

【NONE】